The embodiments of the invention in which an exclusive property or privilege is claimed are defined as follows:

1. A method for generating a first plurality of output data values by transforming a plurality of input data values using a computer, the first plurality of output data values approximating a second plurality of output data values, the second plurality of output data values generated by applying a linear transform to the plurality of input data values, the method comprising at least one step, the step being one of the following:

rearranging at least one data value in a plurality of current input data values;

negating at least one data value in the plurality of current input data values;

modifying at least one data value in the plurality of current input data values, each modified data value generated by applying a linear combination of unmodified values in the plurality of input data values to the at least one data value, the linear combination comprised of an integer generated in a reproducible manner, the integer being from one of a group consisting of a rounded integer and a converted integer; and

a step which is equivalent to a successive combination of one or more steps of the preceding three types.

2. The method of Claim 1 wherein the first plurality of output data values are integers if the plurality of input data values are integers.

3. The method of Claim 2 wherein the plurality of input data values can be reconstructed exactly from the first plurality of output data values.

4. The method of Claim 1 wherein the linear transform has a determinant, the determinant being invertible as one of a group consisting of an integer and an integer Laurent polynomial.

5. The method of Claim 1 wherein the linear transform has a determinant, the determinant being invertible as one of a group consisting of a real number and a real Laurent polynomial, and the method further comprising rescaling at least one of a plurality of bands in the linear transform.

6. The method of Claim 1 wherein the linear transform is a fixed finite-dimensional linear transform.

7. The method of Claim 6 wherein the linear transform has a property that when applied to the plurality of input data values, the plurality of data values being zero

except at one location, the second plurality of output data values generated by applying the linear transform are identical to the plurality of input data values, and the method having the same property.

8. The method of Claim 6 wherein the plurality of input data values includes an input integer plurality and the second plurality of output data values includes an output integer plurality, the linear transform mapping an integer multiple of the input integer plurality to an integer multiple of the integer output plurality, the integer multiple of the input integer plurality corresponding to the integer multiple of the integer output plurality, and the method mapping mapping the integer multiple of the integer input plurality to the corresponding integer multiple of theinteger output plurality.

9. The method of Claim 6 wherein the linear transform is one of a plurality of RGB-to-YCbCr color transforms.

10. The method of Claim 6 wherein the linear transform is a RGB-to-YIQ color transform.

11. The method of Claim 6 wherein the step of modifying the at least one of the plurality of input data values comprises:

successively sweeping through a plurality of bands of input data values in a first direction;

successively adding to each band during each successive sweep in the first direction the linear combination of unmodified values in the plurality of input data values, the linear combination being a rounded linear combination of the plurality of input data values in preceding bands;

successively sweeping through a plurality of bands in a second direction, the second direction being opposite to the first direction;

successively adding to each band during each successive sweep in the second direction the linear combination of unmodified values in the plurality of input data values, the linear combination being a rounded linear combination of the plurality of input data values in preceding bands; and

adding to one of the bands the linear combination of unmodified values in the plurality of input data values, the linear combination being a rounded linear combination of the plurality of input data values in all remaining bands of the generated matrix.

12. The method of Claim 11 wherein the step of rearranging at least one of the plurality of input data values comprises permuting a plurality of bands, the plurality of bands including the plurality of input data values, and wherein the step of modifying the at least one of the plurality of input data values further includes permuting the plurality of bands after adding to one of the bands.

13. The method of Claim 1 wherein the linear transform is a wavelet transform.

14. The method of Claim 13 wherein the linear transform has a property that when applied to the plurality of input data values, the plurality of data values being zero except at one location, the second plurality of output data values generated by applying the linear transform are identical to the plurality of input data values, and the method having the same property.

15. The method of Claim 13 wherein the plurality of input data values includes an input integer plurality and the second plurality of output data values includes an output integer plurality, the linear transform mapping an integer multiple of the input integer plurality to an integer multiple of the integer output plurality, the integer multiple of the input integer plurality corresponding to the integer multiple of the integer output plurality, and the method mapping mapping the integer multiple of the integer input plurality to the corresponding integer multiple of theinteger output plurality.

16. The method of Claim 13 wherein the step of rearranging the at least one data value is performed on only adjacent data values in the plurality of input data values.

17. The method of Claim 13 wherein the step of modifying the at least one data value is performed on only adjacent data values in the plurality of input data values.

18. The method of Claim 13 wherein the wavelet transform is a 9-7 wavelet transform.

19. A method of generating matrix factors for a finite-dimensional linear transform using a computer, each matrix factor represented by a symbol, the linear transform represented by data values stored in a linear transformation matrix having a nonzero determinant, the method comprising:

applying a first LU-decomposition to the linear transformation matrix;

generating four matrices from the LU-decomposition of the linear transformation matrix, the four matrices represented by the symbols $\widetilde{\Pi}$, $\widetilde{\Pi}_2$, $\widetilde{L}$ and $\widetilde{DU}$ and satisfying the relationship $\widetilde{\Pi} A \widetilde{\Pi}_2 = \widetilde{L}\,\widetilde{DU}$, the symbol $\widetilde{\Pi}$ representing a first permutation matrix, the symbol $\widetilde{\Pi}_2$ representing a second permutation matrix, the symbol $\widetilde{L}$ representing a lower triangular matrix having a unit diagonal, and the symbol $\widetilde{DU}$ representing a first upper triangular matrix;

generating a third matrix represented by the symbol $\hat{A}$ from the linear transformation matrix A , the third matrix having a plurality of rows and a determinant of 1;

computing a signed permutation matrix $\prod$ from the linear transformation matrix and the third matrix such that $A=\prod\hat{A}$;

generating a permuted linear transformation matrix represented by the symbol A' from the linear transformation matrix, the permuted linear transformation having a determinant of 1;

computing a second upper triangular matrix represented by the symbol U_1 from the permuted linear transformation matrix and the third matrix, the second upper triangular matrix having a plurality of rows, all diagonal entries equal to 1, and all entries below a first row equal to 0, the second upper triangular matrix satisfying the relationship $\hat{A}=U_1A'$;

factoring the permuted linear transformation matrix into a product including a lower triangular matrix and an upper triangular matrix, the lower triangular matrix and the upper triangular matrix each having a unit diagonal, the lower triangular matrix represented by the symbol L and the upper triangular matrix represented by the symbol U; and

generating the matrix factors for the scaled linear transformation matrix A, the matrix factors including at least the lower triangular matrix L, theupper triangular matrix U, the second upper triangular matrix U_1, and the signed permutation matrix $\prod$, the linear transformation matrix expressed as a product of the matrix factors.

20. The method of Claim 19 further comprising removing a scaling factor from the linear transformation matrix before applying the first LU-decomposition, the

scaled linear transformation matrix having a determinant of 1 and represented by the symbol A.

21. The method of Claim 19 wherein the linear transformation matrix has a determinant equal to one of the group consisting of 1 and –1, the scaling factor is not removed from the linear transformation matrix, and the matrix factors further include a scaling matrix.

22. The method of Claim 19 wherein the scaled linear transformation matrix is an identity matrix if each of the matrix factors is an identity matrix.

23. The method of Claim 19 further including:

generating a matrix comprised of a plurality of input data values stored in a plurality of bands, the plurality of input data values including a plurality of nonzero data values on one of the plurality of bands in the generated matrix, the linear transform not modifying the plurality of nonzero data values in the one band when applied to the plurality of input data values; and

generating a modified linear transformation matrix from the matrix factors generated for the scaled linear transformation matrix, the modified linear transformation matrix storing a modified linear transform, the modified linear transform matching the linear transform when the plurality of nonzero data values in the one band are integer values.

24. The method of Claim 19 further including:

generating a matrix comprised of a plurality of input data values, the plurality of input data values including a one-dimensional range of integer input data values; and

generating a modified linear transformation matrix from at least the matrix factors generated for the scaled linear transformation matrix, the modified linear transformation matrix storing a modified linear transform.

25. The method of Claim 24 wherein:

the linear transform maps the one-dimensional range of integer input data values to a plurality of integer output data values; and

the modified linear transform maps the one-dimensional range of integer input data values to the plurality of integer output data values.

26. A method of generating a sequence of matrix factors for a transformation matrix having a plurality of rows and columns using a computer, the transformation matrix storing data values representing a wavelet transform, the method comprising:

applying at least one plurality of row reduction operations to the transformation matrix; and

generating the sequence of matrix factors from the reduced transformation matrix and the row reduction operations.

27. The method of Claim 26 futher includes removing a scaling factor from the transformation matrix before applying the row reduction operations, the scaled transformation matrix having a determinant with a coefficient equal to one of the group consisting of 1 and –1.

28. The method of Claim 26 wherein the sequence of matrix factors includes a first diagonal matrix generated by extracting a permutation matrix from the reduced transformation matrix.

29. The method of Claim 26 wherein the first diagonal matrix has a nonzero determinant that is other than a monomial with coefficient in a group consisting of 1 and –1, the first diagonal matrix being factored into a plurality of elementary matrices and a second diagonal matrix, the second diagonal matrix having a nonzero coefficient that is one of the group consisting of 1 and –1.

30. The method of Claim 26 wherein each of the matrix factors in the sequence are reduced to a plurality of matrix factors satisfying a locality condition.

31. The method of Claim 26 wherein a plurality of the matrix factors in the sequence are combined to form at least one compound factor.

32. The method of Claim 31 wherein the at least one compound factor is a unit triangular matrix.

33. The method of Claim 26 wherein the transformation matrix has a determinant having a coefficient that is one of the group consisting of 1 and –1.

34. The method of Claim 26 wherein the transformation matrix has a nonzero monomial determinant and the sequence of matrix factors further includes a scaling matrix.

35. The method of Claim 26 further including:

generating a matrix comprised of a plurality of input data values stored in the plurality of rows and columns, each row and column being a band, the plurality of input data values including a plurality of nonzero data values on one of the bands, the wavelet transform not altering the nonzero data values in the one band when applied to the generated matrix; and

generating a modified transformation matrix from the sequence of matrix factors produced for the reduced transformation matrix, the modified transformation matrix storing a modified wavelet transform, the modified wavelet transform matching the wavelet transform stored in the transformation matrix when the plurality of nonzero data values in the one band are integer values.

36. The method of Claim 26 further including:

generating a matrix comprised of a plurality of input data values, the plurality of input data values including a one-dimensional range of integer input data values;

mapping the one-dimensional range of integer input data values to a plurality of integer output data values, the integer input data values mapped to a plurality of integer output data values by the wavelet transform stored in the transformation matrix; and

generating a modified transformation matrix from at least the sequence of matrix factors for the reduced transformation matrix, the modified transformation matrix storing a modified transform, the modified transform mapping the plurality of integer input data values to the plurality of integer output data values.

37. The method of Claim 26 wherein the sequence of matrix factors are generated from the application of the at least one plurality of row reduction operations to adjacent data values stored in the scaled transformation matrix.

38. The method of Claim 26 wherein each of the matrix factors are generated from a time-consecutive application of the at least one plurality of row reduction operations to the scaled transformation matrix, each time-consecutive application applied to data stored in the matrix during a current time-consecutive application and all data stored during at least one prior time-consecutive application, the time-consecutive application resulting in a causal generation of the matrix factors.